What is claimed as new and desired to be protected by Letters Patent of the United States is:

1. An atomic layer doping apparatus comprising:

a first atomic layer doping region for depositing a first dopant species on a first substrate as a monolayer;

a second atomic layer doping region for diffusing said first dopant species in said first substrate, said first and second doping regions being chemically isolated from one another; and

a loading assembly for moving said first substrate from said first doping region to said second doping region, thereby enabling deposition of a first atomic monolayer in said first doping region, followed by diffusion of said first atomic monolayer in said second doping region.

2. The doping apparatus of claim 1, wherein said first and second doping regions are adjacent to one another and chemically isolated.

3. The doping apparatus of claim 2, wherein said first and second doping regions are chemically isolated from one another by a gas curtain.

4. The doping apparatus of claim 3, wherein said gas curtain is formed of an inert gas.

5. The doping apparatus of claim 2, wherein said first and second doping regions are chemically isolated from one another by a physical barrier having a closeable opening through which said loading assembly can move a substrate.

6. The doping apparatus of claim 1, wherein said loading assembly is further able to move said substrate from said second doping region back to said first doping region.

7. The doping apparatus of claim 1 further comprising a plurality of first and second atomic layer doping regions.

8. The doping apparatus of claim 7, wherein said plurality of first and second doping regions are grouped in pairs of first and second doping regions, so that at least said first substrate and a second substrate can be treated simultaneously in respective pairs of first and second doping regions.

9. The doping apparatus of claim 8 further comprising a third pair of first and second atomic layer doping regions for processing a third substrate in said third pair of first and second atomic layer doping regions simultaneously with processing of said first and second substrates.

10. The doping apparatus of claim 7, wherein said loading assembly is located at the center of said doping regions.

11. The doping apparatus of claim 1 further comprising at least one third atomic layer doping region.

12. The doping apparatus of claim 11, wherein said first, second, and third doping regions are adjacent to one another and chemically isolated.

13. The doping apparatus of claim 12, wherein said first, second, and third doping regions are chemically isolated from one another by a gas curtain.

14. The doping apparatus of claim 13, wherein said gas curtain is formed of an inert gas.

15. The doping apparatus of claim 11, wherein said first, second, and third doping regions are chemically isolated from one another by a physical barrier having a closeable opening through which said loading assembly can move a substrate.

16. The doping apparatus of claim 11, wherein said loading assembly is further able to move sequentially said first substrate among said first doping region, said second doping region, and said third doping region.

17. The doping apparatus of claim 16, wherein said loading assembly is further able to move sequentially another substrate among said first doping region, said second doping region, and said third doping region.

18. A method of operating an atomic layer doping apparatus, said doping apparatus comprising a first doping region and a second doping region, said first and second doping regions being chemically isolated from one another, said method comprising the steps of:

positioning a wafer in said first doping region;

introducing a first dopant species into said first doping region and depositing said first dopant species on said wafer as a first atomic monolayer;

moving said wafer from said first doping region to said second doping region; and

introducing dopants from said first atomic monolayer into said wafer in said second doping region.

19. The method of claim 18 further comprising the act of annealing said wafer after said act of introducing said dopants into said wafer.

20. The method of claim 18, wherein said act of introducing said dopants into said wafer includes diffusion of said dopants.

21. The method of claim 18, wherein said act of introducing said dopants into said wafer includes contacting said wafer with a non-reactive plasma.

22. The method of claim 18 further comprising the act of moving said wafer back and forth between said first and second doping regions.

23. The method of claim 18 further comprising the act of moving said wafer back to said first doping region and depositing said first dopant species as a second atomic monolayer.

24. The method of claim 18, wherein said first and second doping regions are adjacent to each other.

25. The method of claim 18 further comprising the act of simultaneously processing at least two wafers among said first and second doping regions and depositing a respective dopant species in each of said doping regions.

26. The method of claim 18, wherein said least two wafers are sequentially moved among said first and second doping regions.

27. A method of conducting atomic layer doping comprising the steps of:

depositing a first atomic monolayer including atoms of a dopant species on a substrate in a first doping region;

moving said substrate from said first doping region to a second doping region, which is chemically isolated from said first doping region; and

introducing said atoms of said dopant species into said wafer.

28. The method of claim 27, wherein said act of depositing said first monolayer species further comprises introducing a first dopant species into said first doping region.

29. The method of claim 27, wherein said act of introducing said atoms of said dopant species into said wafer further comprises introducing a non-reactive plasma into said second doping region and contacting said non-reactive plasma with said first atomic monolayer species.

30. The method of claim 27, wherein said act of introducing said atoms of said dopant species into said wafer further comprises heating said wafer so that said atoms diffuse into a surface region of said wafer.

31. The method of claim 27 further comprising the act of annealing said wafer.

32. The method of claim 27 further comprising the act of moving said substrate back and forth between said first and second doping regions .

33. The method of claim 27, wherein a plurality of first and second doping regions are provided, and said method further comprising depositing said first monolayer on respective substrates and introducing atoms from said first monolayers into respective substrates in respective pairs of first and second doping regions, said first and second doping regions of each pair being adjacent to one another.

34. The method of claim 33, wherein a plurality of substrates, each of said plurality of substrates residing in respective regions, are moved sequentially from said first doping regions to said second doping regions.

35. A method of operating an atomic layer doping apparatus, said doping apparatus comprising a plurality of doping regions, said doping regions being chemically isolated from one another, said method comprising the steps of:

positioning a plurality of wafers in respective doping regions;

introducing a first dopant species into some of said plurality of doping regions and depositing said first dopant species on at least one of said plurality of wafers as a first atomic monolayer, said first atomic monolayer comprising dopant atoms of said first dopant species;

moving said plurality of wafers from said some of said plurality of doping regions to other doping regions; and

introducing a second gas species into said other doping regions and contacting said second gas species on at least one of said plurality of wafers to introduce said dopant atoms into said at least one of said plurality of wafers.

36. The method of claim 35 further comprising the act of sequentially moving said plurality of wafers through at least two of said plurality of doping regions in accordance with a predefined pattern.

37. The method of claim 35, wherein said second gas species is a non-reactive plasma.

38. The method of claim 35 further comprising the act of annealing said at least one of said plurality of wafers.

39. The method of claim 35 further comprising the act of sequentially moving said plurality of wafers through all said doping regions.

40. The method of claim 35 further comprising the act of sequentially moving said plurality of wafers through predetermined regions of said doping regions.

41. A method of conducting atomic layer doping comprising the steps of:

depositing a first atomic monolayer including atoms of a first dopant species on a substrate in a first doping region;

moving said substrate from said first doping region to a second doping region, which is chemically isolated from said first doping region, for depositing a second monolayer including atoms of a second dopant species on said substrate; and

moving said substrate from said second doping region to a third doping region, which is chemically isolated from said first and second doping regions, for introducing said atoms of said first and second dopant species into said wafer.

42. The method of claim 41, wherein said act of introducing said atoms of said first and second dopant species into said wafer further comprises introducing a non-reactive plasma into said third doping region and contacting said non-reactive plasma with said first and second atomic monolayer species.

43. The method of claim 41, wherein said act of introducing said atoms of said first and second dopant species into said wafer further comprises heating said wafer so that said atoms diffuse into a surface region of said wafer.

44. The method of claim 41 further comprising the act of annealing said wafer.

45. The method of claim 41 further comprising the act of sequentially moving said substrate back and forth between said first, second and third doping regions .

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